

## CLAIMS

What is claimed is:

- 5 1. A magnetoresistive sensor comprising:
  - a magnetoresistive free layer;
  - a first ferromagnetic bias layer providing a first
  - bias to the free layer;
  - a second ferromagnetic bias layer providing a second
  - 10 bias to the free layer; and
  - a decoupling layer disposed between the first and
  - second bias layers to substantially eliminate exchange
  - coupling between the first and second bias layers.
- 15 2. The sensor of claim 1, wherein said first bias layer has a coercivity  $H_{c1}$  and said second bias layer has a coercivity  $H_{c2}$  greater than  $H_{c1}$ .
- 20 3. The sensor of claim 2, wherein said first and second bias layers comprise first and second materials respectively, and wherein said first and second materials differ.
- 25 4. The sensor of claim 2, wherein said first and second bias layers comprise first and second materials respectively, and wherein said first and second materials are the same.
- 30 5. The sensor of claim 2, wherein said first and second biases are independently adjustable by application of an external magnetic field.

6. The sensor of claim 1, wherein said first bias layer includes a first plurality of crystal grains and said second bias layer includes a second plurality of crystal grains substantially uncorrelated with said first  
5 plurality.

7. The sensor of claim 1, wherein said second bias layer is deposited on top of said decoupling layer, and wherein an easy magnetization direction of said second bias layer is  
10 constrained, by said decoupling layer, to be parallel to an interface between said decoupling layer and said second bias layer.

8. The sensor of claim 1, wherein said decoupling layer  
15 comprises Rh.

9. The sensor of claim 1, wherein said decoupling layer comprises a bcc metal.

20 10. The sensor of claim 1, wherein said decoupling layer comprises an fcc metal.

11. The sensor of claim 1, wherein said decoupling layer comprises a CrX alloy, where X is Mo, Mn, Co, Ti, Ta, V, Zr, or Nb.  
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12. The sensor of claim 1, wherein said first bias layer comprises a first binary, ternary or quaternary alloy of Co, and wherein said second bias layer comprises a second  
30 binary, ternary or quaternary alloy of Co.

13. The sensor of claim 12, wherein said first alloy comprises  $\text{Co}_x\text{Pt}_{1-x}$  where  $0.5 < x < 1$ , and wherein said second alloy comprises  $\text{Co}_y\text{Pt}_{1-y}$  where  $0.5 < y < 1$ .

5 14. The sensor of claim 1, wherein said sensor is a magnetic recording head.